

REMARKS

The Office Action dated September 8, 2004, has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto.

Claims 1, 9, 11, 21 and 22 are amended to more particularly point out and distinctly claim the subject matter of the invention. No new matter is added. Thus, claims 1-34 are pending in the present application and are respectfully submitted for consideration.

As a preliminary matter, the Office Action indicated that claims 13-15, 20, 24-27 and 32-34 are allowed. The Office Action also indicated that claims 9-12, 22 and 23 contained allowable subject matter and would be allowable if amended to be in independent form. Claims 9, 11 and 22 are amended to place the subject matter of these claims in condition for allowance. Thus, applicant submits that claims 9-15, 20, 22-27 and 32-34 are allowable. Applicant acknowledges with appreciation the finding of allowable subject matter.

Claims 21, 28 and 30 were rejected under 35 U.S.C. §102(e) as allegedly being anticipated by U.S. Patent No. 6,768,578 (*Kinoshita et al.*). The Office Action took the position that *Kinoshita* taught all the elements of claims 21, 28 and 30. Applicant respectfully submits that the presently pending claims recite subject matter that is neither disclosed nor suggested by the cited reference.

Claim 21, upon which claims 28 and 30, recites a method for fully utilizing an optical spectrum spanning a predefined low attenuation region of an optical transmission spectrum, for communicating information on optical fibers of an optical network. The method includes separating optical signals within the predefined low-attenuation region into in-band and out-band optical signals. The in-band signals substantially correspond to a first wavelength range within the predefined low-attenuation region designated for optical amplification. The out-band signals substantially correspond to a second wavelength range within the predefined low-attenuation region and exclusive of the first wavelength range. The method also includes routing the in-band and out-band optical signals over different protection paths to in-band and out-band output ports associated with destination nodes for the in-band and out-band signals respectively. The method also includes combining the in-band and out-band optical signals from the in-band and out-band output ports to provide a united collection of the optical signals for collective transmission.

As discussed in the specification, examples of the present invention enable utilization of the optical communications band while providing various protections on a mesh/ring network. Thus, full utilization of an ultra-wide optical communication band spanning the useable band of the optical transmission spectrum may be realized, while providing appropriate protection strategies on the mesh/ring network for all channels within the ultra-wide optical communication band. It is respectfully submitted that the cited reference fails to disclose or suggest all the elements of any of the presently pending

claims. Therefore, the cited reference fails to provide the critical and unobvious advantages discussed above.

Kinoshita relates to an optical amplifier for amplifying a WDM light including light in different wavelength bands. *Kinoshita* describes the optical amplifier being configured so that the first and second lights travel through the dispersion compensator in opposite directions. Referring to Figure 3 of *Kinoshita*, optical fiber amplifier section 2 and optical fiber amplifier section 3 are shown. Before being sent to the post-stage optical amplifier sections, the wavelength band signal lights are taken out, multiplexed in WDM coupler 10, and sent to a DCF 11. The signal lights are demultiplexed into a first and a second band in WDM coupler 12, and returned to the post-stage optical amplifier sections of optical amplifier sections 2 and 3. Further, *Kinoshita* describes amplifying the signal inputs to a predetermined level with the gain being controlled by automatic gain control circuits 21 and 31. *Kinoshita*, however, does not disclose or suggest the feature of routing in-band and out-band optical signals over different protection paths to in-band and out-band output ports associated with destination nodes for the in-band and out-band signals.

In contrast, claim 21 recites "routing the in-band and out-band optical signals over different protection paths to in-band and out-band output ports associated with destination nodes for the in-band and out-band signals respectively." Applicant submits that *Kinoshita* fails to disclose or suggest at least these features of the presently pending claims.

Applicant submits that *Kinoshita* does not disclose or suggest different protection paths for the signals. As discussed above, *Kinoshita* describes taking out the wavelength band signals, and amplifying them to a predetermined level with automatic gain control circuits 21 and 31. This aspect of *Kinoshita* does not disclose or suggest routing in-band and out-band optical signals over different protection paths to in-band and out-band output ports. *Kinoshita* does not disclose or suggest routing the signals within the wavelength bands to different protection paths. Thus, applicant submits that the cited reference does not disclose or suggest all the features of claim 21. Claims 28 and 30 depend from claim 21, and are not disclosed or suggested for at least the reasons provided above, and because claims 28 and 30 recite additional patentable subject matter. Thus, applicant respectfully requests that the anticipation rejection of claims 21, 28 and 30 be withdrawn.

Claims 29 and 31 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over *Kinoshita* in view of U.S. Patent No. 5,457,760 (*Mizrahi*). The Office Action took the position that *Kinoshita* taught the elements of claims 29 and 31, except the feature of a fiber Bragg grating as a coupler, or band splitter. The Office Action then alleged that *Mizrahi* provided those features missing from *Kinoshita*. Applicant respectfully submits that the cited references, either alone or in combination, do not disclose or suggest all the features of any of the presently pending claims.

Claims 29 and 31 depend from claim 21. Claim 21 is summarized above.

As discussed above, *Kinoshita* does not disclose or suggest all the features of independent claim 21. Applicant submits that *Mizrahi* does not disclose or suggest those patentable features of claim 21 missing from *Kinoshita*.

Mizrahi relates to wavelength division optical multiplexing elements. *Mizrahi* describes using arrays for optical filtering elements to create a desired wavelength passband in an optical fiber. An optical demultiplexer is formed using an input waveguide coupled to plural output wavelengths. Each output waveguide includes a wavelength selective configuration of optical filtering elements formed within a contiguous portion of the waveguide forming an optical channel-selective filter having spectral regions with an optical transmission passband and spectral regions of low transmissivity. *Mizrahi*, however, does not disclose or suggest the feature of routing in-band and out-band optical signals over different protection paths to in-band and out-band output ports associated with destination nodes for the in-band and out-band signals.

In contrast, claim 21 recites "routing the in-band and out-band optical signals over different protection paths to in-band and out-band output ports associated with destination nodes for the in-band and out-band signals respectively." Applicant submits that the cited references, either alone or in combination, fail to disclose or suggest at least these features of the presently pending claims.

As discussed above, *Kinoshita* does not disclose or suggest all the features of claim 21. Applicant submits that *Mizrahi* also does not disclose or suggest routing optical signals over different protection paths to output ports associated with destination

nodes. Instead, *Mizrahi* describes performing WDM using optical filtering elements to transmit a characteristic wavelength band. Applicant submits that this aspect of *Mizrahi* does not disclose or suggest routing in-band and out-band signals over different protection paths. For example, *Mizrahi* does not disclose or suggest using protection paths after performing the WDM using the filtering elements. Thus, the cited references, either alone or in combination, do not disclose or suggest all the features of any of the presently pending claims.

Further, claims 29 and 31 depend from independent claim 21. As discussed above, the cited references do not disclose or suggest all the features of claim 21. If an independent claim is nonobvious, then any claim depending from the independent claims is nonobvious. MPEP 2143.03. Thus, claims 29 and 31 are not rendered obvious by the cited references, and applicant respectfully requests that the obviousness rejection be withdrawn.

Claims 1-8 and 19 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,151,160 (*Ma et al.*) in view of U.S. Patent No. 6,272,154 (*Bala et al.*) or U.S. Patent No. 5,488,501 (*Barnsley*). The Office Action took the position that *Ma* taught all the elements of claims 1-8 and 18, except “a cross-connect to receive the first and second pluralities of optical signals and to route the signals through cross-connect to targeted output ports.” The Office Action then alleged that *Bala* or *Barnsley* provided those features of the claims missing from *Ma*. Applicant

respectfully submits that the cited references, either alone or in combination, do not disclose or suggest all the features of any of the presently pending claims.

Claim 1, upon which claims 2-19 depend, recites a network node circuit for use in wavelength division multiplexing (WDM) optical networks to allow utilization of a wide optical communication band. The node circuit includes a band splitter having an input to receive a plurality of optical signals sent on a corresponding plurality of wavelengths of an optical communication band, and to separate a first plurality of the optical signals within a first wavelength range within an amplification band of the optical communication band from a second plurality of the optical signals within a second wavelength range outside the amplification band of the optical communication band. The node circuit also includes a cross-connect circuit having input ports to receive the first and second pluralities of the optical signals and to route the first and second pluralities of the optical signals over different protection paths through the cross-connect circuit to targeted output ports. The node circuit also includes a band combiner coupled to the cross-connect circuit to receive the first and second pluralities of the optical signals, and to combine the first and second pluralities of the optical signals to an aggregate plurality of optical signals for transmission from the network node.

Ma relates to a broadband Raman pre-amplifier for wavelength division multiplexed optical communication systems. *Ma* describes a splitter 303 to divide the incoming multiplexed signal into N output bands that are directed to optical amplifiers 308. The bands are recombined in wavelength routing device 305 before exiting the

amplifier arrangement on fiber 306. *Ma*, however, does not disclose or suggest the feature of a cross-connect circuit having input ports to route the first and second pluralities of optical signals over different protection paths through the cross-connect circuit to targeted output ports.

Bala relates to reconfigurable multiwavelength network elements. *Bala* describes a network element that uses multiplexer, demultiplexer and cross-connect functions as basic building blocks. A network element 200 is shown in Figure 2 of *Bala* with all signals propagating from left to right. Element 200 includes demultiplexer 210, multiplexer 230 and cross-connect 250. Cross-connect 250 routes pass-through signals to the corresponding signal-channel input ports on the multiwavelength terminal multiplexer 230. Cross-connect 250 include cross-connect switches 255 that function under software control to couple input signals to selected outputs. *Bala*, however, does not disclose or suggest the feature of a cross-connect circuit having input ports to route the first and second pluralities of optical signals over different protection paths through the cross-connect circuit to targeted output ports.

Barnsley relates to an optical processing system. *Barnsley* describes ensuring that sufficient delay occurs between the transmission start times of the control and data signals that the control signal completely overlaps the data signal at the second node. A node 41 that wants to transmit data to another node 41 within the network chooses the correct data wavelength and the correct control signal wavelength. Cross-connect 43 routes control signal bands rather than single wavelengths so that a band of wavelengths

is routed rather than routing each of these wavelengths separately. *Barnsley*, however, does not disclose or suggest the feature of a cross-connect circuit having input ports to route the first and second pluralities of optical signals over different protection paths through the cross-connect circuit to targeted output ports.

In contrast, claim 1 recites "a cross-connect circuit having input ports to receive the first and second pluralities of the optical signals and to route the first and second pluralities of the optical signals over different protection paths through the cross-connect circuit to targeted output ports." Applicant submits that the cited references, either alone or in combination, do not disclose or suggest at least these features of the presently pending claims.

As stated in the Office Action, *Ma* does not disclose or suggest a cross-connect circuit, as recited in claim 1. Applicant submits that neither *Bala* nor *Barnsley* discloses or suggests at least these patentable features missing from *Ma*. Applicant submits that *Bala* and *Barnsley* do not disclose or suggest routing the first and second pluralities of input signals over different protection paths. Cross connect 250 of *Bala* routes signals to amplifiers, while cross-connect 43 of *Barnsley* routes control signal bands. These aspects of *Bala* and *Barnsley* do not disclose or suggest a cross-connect circuit to route optical signals over different protection paths. Therefore, the cited references, either alone or in combination, do not disclose or suggest all the features of claims 1-8 and 18. Applicant respectfully requests that the obviousness rejection of claims 1-8 and 18 be withdrawn.

Claim 16 was rejected under 35 U.S.C. § 103(a), as allegedly being unpatentable over *Ma* in view of *Bala* or *Barnsley*, and further in view of *Mizrahi*. The Office Action took the position that *Ma* in view of *Bala* or *Barnsley* taught all the elements of claim 16, except the band splitter comprising a fiber Bragg grating band splitter. The Office Action then alleged that *Mizrahi* provided these patentable features of claim 16 missing from *Ma*, *Bala*, and *Barnsley*. Applicant respectfully submits that the cited references, either alone or in combination, do not disclose or suggest all the features of any of the presently pending claims.

Claim 16 depends from claim 1. Claim 1 is summarized above.

As discussed above, *Ma*, *Bala* and *Barnsley*, either alone or in combination, do not disclose or suggest the patentable features of a cross-connect circuit having input ports to route the first and second pluralities of optical signals over different protection paths through the cross-connect circuit to targeted output ports. Applicant submits that *Mizrahi* does not disclose or suggest at least these features of claim 1. As discussed above, *Mizrahi* does not disclose or suggest the patentable features of routing in-band and out-band optical signals over different protection paths to in-band and out-band output associated with destination nodes for the in-band and out-band signals. Applicant submits the optical filtering elements of *Mizrahi* also do not disclose or suggest a cross-connect circuit, as recited in claim 1. Thus, *Mizrahi* also does not disclose or suggest a cross-connect circuit to route in-band and out-band optical signals over different

protection paths. Thus, the cited references do not disclose or suggest all the features of claim 16.

Further, claim 16 depends from claim 1. As discussed above, claim 1 is not rendered obvious by the cited references. If an independent claim is nonobvious, then any claim depending from the claim is nonobvious. MPEP 2143.03. Therefore, claim 16 is not rendered obvious, and applicant respectfully requests that the obviousness rejection to claim 16 be withdrawn.

Claim 17 was rejected under 35 U.S.C. § 103(a), as allegedly being unpatentable over *Ma* in view of *Bala* or *Barnsley* and further in view of U.S. Patent No. 6,567,196 (*Archambault*). The Office Action took the position that *Ma*, *Bala* and *Barnsley* taught all the features of claim 17, except that the band combiner is a fiber Bragg grating band combiner. The Office Action then alleged that *Archambault* provided those features of claim 17 missing from *Ma*, *Bala* and *Barnsley*. Applicant respectfully submits that the cited references, either alone or in combination, do not disclose or suggest all the features of any of the presently pending claims.

Claim 17 depends from claim 1. Claim 1 is summarized above.

Archambault relates to dense WDM optical multiplexer and demultiplexer. *Archambault* describes supplying optical channels to be demultiplexed to first and second optical fibers via an optical splitter. The optical splitter introduces an optical power loss at the input to the demultiplexer. Total power loss associated of *Archambault* may be reduced compared to an n channel demultiplexer based on a 1 x n splitter. *Archambault*,

however, does not disclose or suggest the feature of a cross-connect circuit having input ports to route the first and second pluralities of optical signals over different protection paths through the cross-connect circuit to targeted output ports.

In contrast, as noted above, claim 1 recites "a cross-connect circuit having input ports to receive the first and second pluralities of the optical signals and to route the first and second pluralities of the optical signals over different protection paths through the cross-connect circuit to targeted output ports." Applicant submits that the cited references, either alone or in combination, do not disclose or suggest at least these features of the presently pending claims.

As discussed above, *Ma*, *Bala*, and *Barnsley* do not disclose or suggest at least these features of claim 1, and as stated in the Office Action, these references do not disclose or suggest all the features of claim 17. Applicant submits that *Archambault* does not disclose or suggest those features of claim 1 missing from *Ma*, *Bala*, and *Barnsley*. *Archambault* does not disclose or suggest a cross-connect circuit to route the first and second pluralities of the optical signals over different protection paths. *Archambault* describes using an optical splitter to demultiplex optical channels. *Archambault* does not disclose or suggest splitting the optical channels to different protection paths. The splitting of optical channels does not disclose or suggest a cross-connect circuit to route signals to different protection paths. Thus, these aspects of *Archambault* do not disclose or suggest a cross-connect circuit, as recited in the claims. Applicant submits that the

cited references, either alone or in combination, do not disclose or suggest all the features of the pending claims.

Further, claim 17 depends from claim 1. As discussed above, claim 1 is not rendered obvious by the cited references. If an independent claim is nonobvious, then any claim depending from the claim is nonobvious. MPEP 2143.03. Therefore, claim 17 is not rendered obvious, and applicant respectfully requests that the obviousness rejection to claim 17 be withdrawn.

Claim 19 was rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over *Ma* in view of *Bala* or *Barnsley*, and further in view of U.S. Patent No. 5,940,197 (*Ryu*) or U.S. Patent No. 5,771,112 (*Hamel et al.*). The Office Action took the position that *Ma*, *Bala* and *Barnsley* teach all the features of claim 19, except an optical add/drop multiplexer to selectively add and drop additional optical signals to the first and second plurality of wavelength ranges. The Office Action then alleged that *Ryu* or *Hamel* provided these features of claim 19 missing from *Ma*, *Bala* and *Barnsley*. Applicant submits that the cited references, either alone or in combination, do not disclose or suggest all the features of any of the presently pending claims.

Claim 19 depends from claim 1. Claim 1 is summarized above.

Ryu relates to an optical add-drop device in which the wavelength and number of split or inserted signal light can be set as needed. An optical splitter 2 splits WDM signal light inputted from optical line 1 and inputs the light into injection-locked laser devices. Depending on the injection-locked laser device, the signal light is amplified or outputted.

The signal lights are inputted to optical combiner 10 to be combined and outputted to optical line 11. Applicant, however, submits that *Ryu* does not disclose or suggest the feature of a cross-connect circuit having input ports to route the first and second pluralities of optical signals over different protection paths through the cross-connect circuit to targeted output ports.

Hamel relates to a reconfigured device for insertion-extraction of wavelengths. *Hamel* describes the device having optical add-drop multiplexers M1 to M4, with each multiplexer having a bandpass filter. Referring to Figure 1 of *Hamel*, optical switch C1 has an input 2 and as many outputs as there are multiplexers. Optical coupler C2 has as many inputs as there are multiplexers and an output 5. *Hamel*, however, does not disclose or suggest the feature of a cross-connect circuit having input ports to route the first and second pluralities of optical signals over different protection paths through the cross-connect circuit to targeted output ports.

In contrast, as noted above, claim 1 recites "a cross-connect circuit having input ports to receive the first and second pluralities of the optical signals and to route the first and second pluralities of the optical signals over different protection paths through the cross-connect circuit to targeted output ports." Applicant submits that the cited references, either alone or in combination, do not disclose or suggest at least these features of the presently pending claims.

As discussed above, *Ma*, *Bala*, and *Barnsley* do not disclose or suggest at least these features of claim 1, and as stated in the Office Action, these references do not

disclose or suggest all the features of claim 19. Applicant submits that neither *Ryu* nor *Hamel* disclose or suggest those features of claim 1 missing from *Ma*, *Bala*, and *Barnsley*. *Ryu* and *Hamel* do not disclose or suggest a cross-connect circuit to route the first and second pluralities of the optical signals over different protection paths. *Ryu* describes using an optical splitter to split signal light to various devices. This aspect of *Ryu* does not disclose or suggest a cross-connect circuit to route optical signals over different protection paths. *Hamel* describes a switch to output signals to a number of multiplexers. This aspect of *Hamel* does not disclose or suggest a cross-connect circuit to route optical signals over different protection paths. Applicant submits that the devices of *Ryu* and the multiplexers of *Hamel* do not disclose or suggest different protection paths, as recited in claim 1. Thus, the cited references, either alone or in combination, do not disclose or suggest all the features of the pending claims.

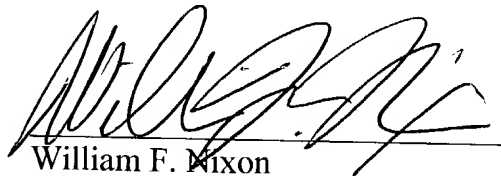
Further, claim 19 depends from claim 1. As discussed above, claim 1 is not rendered obvious by the cited references. If an independent claim is nonobvious, then any claim depending from the claim is nonobvious. MPEP 2143.03. Therefore, claim 19 is not rendered obvious, and applicant respectfully requests that the obviousness rejection to claim 19 be withdrawn.

It is submitted that, like the allowed and allowable claims, each of claims 1-8, 16-19, 21, and 28-31 recite subject matter that is neither disclosed nor suggested in the cited references, either alone or in combination. It is therefore respectfully requested that all of claims 1-34 be allowed, and this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicant's undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,



William F. Nixon
Registration No. 44,262

Customer No. 32294
SQUIRE, SANDERS & DEMPSEY LLP
14TH Floor
8000 Towers Crescent Drive
Tysons Corner, Virginia 22182-2700
Telephone: 703-720-7800
Fax: 703-720-7802

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